

ENGELMANN SPRUCE BEETLE CONDITIONS
BRIDGER NATIONAL FOREST

APPRAISAL SURVEY
August - September 1957

INTRODUCTION

A serious outbreak of Engelmann spruce beetle (Dendroctonus engelmanni Hopk.) was revealed during an aerial survey of the Bridger National Forest in Wyoming by Station personnel in September of 1955^{1/}. The fact that large numbers of dead spruce were visible from the air indicated that the outbreak had been developing for some time.

HISTORY OF OUTBREAK TO DATE

On September 22, 1955 Paul Grossenbach of Timber Management R-4 and the author ground checked the area. This examination confirmed the epidemic nature of the infestation. A survey crew was organized and was operating by September 26. It was soon obvious that the limits of the infestation extended beyond those detectable from the air. It was estimated that there were approximately 30,000 trees infested over an estimated 24,000 gross acres.

Regional office, Bridger Forest, and Station personnel met to discuss the situation and develop a program. Decision was reached to start a program immediately with two objectives: (1) utilize salvageable material, (2) reduce beetle populations through logging and trap logs. Timber sales were drawn up, advertised, and awarded late in 1955 with cutting scheduled for the spring of 1956. Successful bidders were awarded the purchase of 47 million board feet of timber. Access roads were surveyed and construction started. Approximately 2,200 trap trees were felled before heavy winter snows fell.

Logging started in 1956. The 1955 trap logs were treated and new traps cut late in the season. A similar program of logging and trapping was in effect during 1956.

Entomological observations indicated that both 2-year and 1-year broods were present. It was determined that the 1957 flight of beetles from 1-year broods would be significantly lighter than the flight to occur in 1958. This fact was utilized in designing the trap tree program for the two years. It was estimated that as many as 15,000 traps might be needed to absorb the expected 1958 flight of beetles.

^{1/} Bridger National Forest Annual Aerial Survey, September 1955 by R. I. Washburn.

1957 SURVEY

Requests for additional information on the Bridger outbreak required considerable survey activity during the fall months of 1957. Late in August and extending into September a survey was conducted to determine the present extent and severity of the outbreak. The survey was a cooperative effort of the Bridger National Forest, Timber Management of the Regional office, and the Division of Forest Insect Research, Intermountain Forest and Range Experiment Station. The data will facilitate planning the 1957 trap tree cutting and in addition will furnish sufficient data for analysis of the present action program and determine any changes required to improve control possibilities.

Methods

A systematic 10 percent line plot survey was employed to cover all infested areas. A 1/5-acre circular plot was taken every two chains along parallel lines run in a cardinal direction most nearly at right angles to the major contours. The lines were spaced 10 chains apart and tied into section lines to facilitate mapping. Infested trees and stumps appearing on all plots were recorded by DBH and stage of insects. In addition, at every tenth plot (making a 1 percent cruise) trees killed in 1955-1956, trees killed prior to 1955, and all green Engelmann spruce trees over 6 inches DBH were recorded.

Results

Intensive ground examination of all Engelmann spruce stands within 4 to 10 miles of the main infestation revealed no Engelmann spruce beetle activity other than the normal endemic population. Areas examined included the spruce areas in the Green River and its tributaries above the Green River lakes; especially the Porcupine drainage and in the Slide Lake area. Tributaries below the Green River lakes examined were Teepee Creek, Tosi Creek, Rock Creek and Roaring River, as well as the head of the Gros Ventre River. South of the present infestation the appraisal was extended to and including Boulder Creek and Boulder Basin.

The results of the line-plot survey in the Gypsum Creek area show that the epidemic has remained within the infestation boundaries described in 1955. The Gypsum Creek infested area was broken into five survey units: Moose Creek, West Gypsum, East Gypsum, South Gypsum, and Jim Creek.

Moose Creek Unit. 7,500 acres, 2,500 infested trees and stumps.

The Moose Creek unit includes the spruce type on the north and east facing slopes that drain directly into the Green River and extends from the Green River Lake around the bend to and including Moose Creek. This area contains about 2,500 infested trees and stumps of which approximately 1,400 infested units are harbouring over-wintering adults. Most of the

infested trees are located near the head of the main fork of Moose Creek. Only about 70 of the infested units are stumps.

West Gypsum Unit. 2,700 acres, 500 infested trees and stumps.

West Gypsum unit is a small area on the west side of Gypsum Creek containing some Engelmann spruce in the lodgepole pine stands. About 20 percent of the 500 infested units estimated to be in the area are stumps containing overwintering adult beetles. Most of the trees attacked in 1955-1956 have been logged--some containing brood. Logging is still in progress in this unit and should remove some of the presently infested trees.

East Gypsum Unit. 6,500 acres, 18,500 infested trees and stumps.

The East Gypsum Unit is bounded on the west by Gypsum Creek; on the south by the north ridge of the south fork of Gypsum Creek; the east by timberline; and on the north by the divide between the Green River and Gypsum Creek. The survey estimates show an increase from 8,300 trees killed in 1955-1956 to 18,500 trees and stumps now containing Engelmann spruce beetle population. Actually, these figures present a false picture because many of the 1955-1956 trees have been removed by the two active cutting operations within the unit. Nearly 3,000 of the units are infested stumps. At the time of the survey the data shows that 27 percent of the stand had been killed or was infested. Over 75 percent of the infested units contained overwintering adults.

South Gypsum Unit. 6,100 acres, 13,900 infested trees and stumps.

The South Gypsum unit includes all of the South Fork of Gypsum Creek and the north side of Jim Creek. Over 33 percent of the spruce timber has been killed or is presently infested. The survey shows there are about 13,900 infested trees and stumps in the unit. Of the total 82 percent contain overwintering adults. To date little or no logging has been done in this unit, therefore most of the infested units are standing trees.

Jim Creek. 1,400 acres, 1,600 infested trees and stumps.

The Jim Creek unit is the south side of the Jim Creek drainage. This unit has an estimated 1,600 infested trees or stumps (less than 1 percent are stumps) on about 1,400 acres. About 86 percent of the infested trees contain overwintering adults.

Observations show a slight decrease in the number of currently infested trees over last year, but the brood population seems to be about the same density and vigor in the infested trees. In view of this, the reduction in the number of infested trees could possibly be attributed to the trap tree program carried on in this area for the last two years. About 11 percent of the Engelmann spruce in the unit has been killed.

DISCUSSION AND RECOMMENDATIONS

The detection and appraisal survey work done in and around the Gypsum Creek Engelmann spruce beetle outbreak shows the infestation has not spread into spruce stands that are contiguous or those within 10 miles of the present outbreak. The outbreak has increased in severity within the infestation boundaries. The survey shows 36,900 trees and stumps (less than 10 percent were stumps) presently infested within a gross area of 24,200 acres and a net spruce type area of about 12,000 acres. Nothing was found to indicate natural factors would cause a significant reduction in the beetle population for at least a year.

At the rate the beetle population is increasing, logging alone cannot be expected to reduce the beetle population sufficiently. Therefore the trap tree program must be continued in conjunction with logging.

So far all the trap trees have been heavily attacked. There is some evidence the trap tree program may be responsible for some brood reduction, principally in the Jim Creek unit. A majority (77 percent) of the infested trees and stumps contain overwintering adults. This substantiates the prediction made two years earlier that the spring of 1958 would be the most effective time to capture the beetles in a trap tree program.

A meeting of Regional, Station, and Forest representatives was held immediately after the completion of the survey to discuss the findings of the survey and to decide on a plan of action. It was decided the program as originally outlined in 1955 for reduction of beetle population through logging and trap logs was still sound and the best solution to the problem. In light of present conditions, forest administration felt it was desirable to do everything possible to accelerate the logging operations. Our rough estimate calling for about 15,000 trap trees to be laid down the fall of 1957 was adjusted, using the current survey data, to 12,800 traps. The 12,800 trap trees are to be laid down in the approximate quantity and location as indicated on the attached map. We feel with an accelerated trap tree program that includes the removal or treatment of all traps, plus attacked standing trees in the immediate vicinity, it may be possible to "pinch in" this infestation to the extent that Jim Creek and possibly the Moose Creek unit could be cleaned up in a year or two. If this attack is successful it may be possible to further reduce the size of the infested area by pushing the defensive lines of traps northward. This, of course, would call for a repeated trap tree program or standing tree treatment of the areas outside the main trap lines, probably until the epidemic is reduced materially or subsides naturally.

The traps laid down this fall by the loggers should concentrate at least some of the beetle population within the main infestation, and in this way reduce the number of "leave trees" that might be attacked.

In the West Gypsum Unit there is no apparent concentration of attacked trees and an average of only .18 attacked trees per acre. Logging slash in the area in all probability will be sufficient to absorb a good share of the remaining beetle population. This material may need treatment. It is probable that any concentration of traps laid down in this unit might attract beetles from the East Gypsum Unit and thereby increase rather than decrease the infestation in this unit.

It is obvious that continued vigilance must be maintained to detect any spread or buildup in the nearby spruce stands. It should also be recognized that proper timing, location, number of trap trees and the removal or treatment of all traps before the beetles leave them is the key to the success of the program.

Table 1.--Survey estimates by insect stages and diameter classes

Number of infested trees and stumps

DBH	Adults	Eggs	Larvae	Pupa	Total
Stumps	890	40	1,830	370	3,130
0-8	850	20	270	120	1,260
9-12	4,010	150	1,440	170	5,770
13-16	7,040	80	1,140	150	8,410
17-20	6,360	120	880	170	7,530
21-24	3,890	50	450	50	4,440
25-28	2,450	20	310	60	2,840
29-32	2,030	10	230	90	2,410
33 & over	<u>1,030</u>	<u>10</u>	<u>110</u>	<u>0</u>	<u>1,150</u>
Total	28,550	500	6,710	1,180	36,940

Table 2.--Survey estimates by insect stages and survey units

Number of infested trees and stumps

Unit	Adults	Eggs	Larvae	Pupa	Total
Moose	1,450	40	920	70	2,480
West Gypsum	190	20	290	0	500
East Gypsum	14,160	380	3,080	870	18,490
South Gypsum	11,400	60	2,250	200	13,910
Jim	<u>1,350</u>	<u>0</u>	<u>170</u>	<u>40</u>	<u>1,560</u>
Total	28,550	500	6,710	1,180	36,940

**Table 3.--Survey estimates by survey units
and diameter classes**

Number of infested trees and stumps

DBH	Moose Creek	West Gypsum	East Gypsum	South Gypsum	Jim Creek	Total
Stumps	70	90	2,950	20	0	3,130
0-8	220	60	580	390	10	1,260
9-12	610	60	2,140	2,710	250	5,770
13-16	590	70	3,500	3,860	390	8,410
17-20	550	60	3,650	2,920	350	7,530
21-24	180	50	2,290	1,780	140	4,440
25-28	160	30	1,490	980	180	2,840
29-32	90	50	1,220	850	200	2,410
33 & over	<u>10</u>	<u>30</u>	<u>670</u>	<u>400</u>	<u>40</u>	<u>1,150</u>
Totals	2,480	500	18,490	13,910	1,560	36,940

Table 4.--Estimates of Gypsum Creek Engelmann spruce beetle infestation
(based on a 10% survey of infested material and a 1% loss and
green tree survey.)

Unit	Gross area acres	N. A. ^{a/}	N. A./a	Killed 1955- 1956	Killed prior to 1955	Green trees over 6" DBH	Percent stand killed or infested
Moose Creek	7,500	2,500	.33	4,100 ^{b/}	14,900	214,300	09
West Gypsum	2,700	500	.18	0	1,100	18,400	08
East Gypsum	6,500	18,500	2.85	8,300	22,900	133,400	27
South Gypsum	6,100	13,900	2.28	8,500	16,400	78,400	33
Jim Creek	1,400	1,600	1.14	2,500	2,900	56,700	11
Total	24,200	36,900	1.52	23,400	58,200	501,500	19
				81,600			

Figures rounded to nearest hundred.

^{a/} N. A. * infested trees and stumps

^{b/} Most of 1955-1956 killed trees were removed through logging

Legend

Scale: 1 inch = 1 mile



Survey unit boundaries



Approximate location and number
of traps to be felled fall 1957

